PATENT ABSTRACTS OF JAPAN

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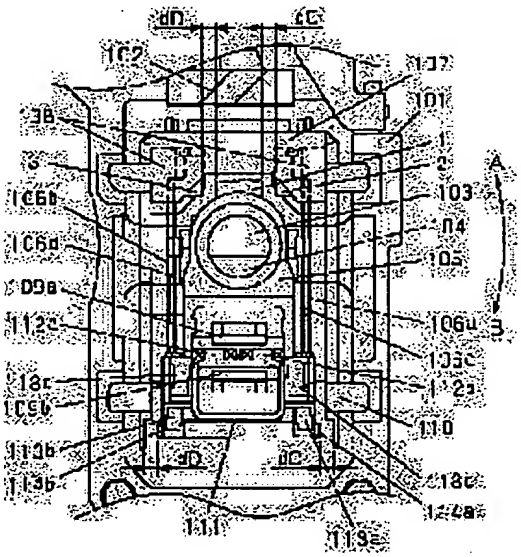
(54) DEVICE FOR DRIVING OBJECTIVE LENS

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an objective lens driving device that imparts no unnecessary tilt to an objective lens at the time of impact and that can correctly record and reproduce information on an optical disk.

SOLUTION: A lens holder 105 on which an objective lens 103 is loaded is supported elastically by suspensions 106a, 106b, 106c, 106d at one end. The other end of the suspensions 106a-106d is fixed on a suspension holder 107. With impact applied to an objective lens driving device, and with the lens holder 105 rotated/displaced around the optical axis of the objective lens, the suspensions 106a-106d are deformed plastically, causing unnecessary tilt on the lens holder 105. In order to solve this problem, stoppers 1, 2 are provided for the lens holder 105, thereby controlling the rotation/displacement of the objective lens around the optical axis and limiting the deformation of the suspensions 106a-106d within the elastic deformation range.



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CLAIMS

[Claim(s)]
[Claim 1] The lens holder in which the objective lens which forms a spot on the record layer of an optical disk was carried, The suspension where it is fixed to said lens holder, and an end carries out elastic support of said lens holder so that said lens holder may be made movable to radial [of said optical disk / the thickness direction and radial], The suspension holder holding the other end of said suspension, and the magnet made to generate magnetic flux, The actuator base which is made to arrange said magnet to a position and carries out positioning immobilization of said suspension holder at a position, The focal coil which it is carried [coil] in said lens holder and makes said lens holder generate the thrust to the thickness direction of said optical disk by the magnetic circuit of said magnet and said actuator base, It has the tracking coil which it is carried [coil] in said lens holder and makes said lens holder generate the radial thrust of said optical disk by the magnetic circuit of said magnet and said actuator base. rotation of the circumference of the optical axis of said objective lens generated in said lens holder by the external impact -- the rotation which regulates a variation rate -- a variation rate -- the objective lens driving gear equipped with the regulation means.
[Claim 2] The objective lens driving gear according to claim 1 which equipped the both ends of a lens holder with the radial displacement specification-part material of an optical disk to the tangential direction of an optical disk as a rotation displacement regulation means.
[Claim 3] The objective lens driving gear according to claim 1 which equipped the position of a lens holder with the displacement specification-part material to the tangential direction of an optical disk as a rotation displacement regulation means.
[Claim 4] The objective lens driving gear according to claim 1 which it had [driving gear] the notching section prepared in the position of the actuator base or a suspension holder, and the radial height of an optical disk prepared in the position of a lens holder as a rotation displacement regulation means, and made said height insert in said notching section.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the objective lens driving gear used for the optical disk unit which irradiates the optical spot to which the light of semiconductor laser was extracted with the lens, and reproduces and eliminates record or the information currently recorded beforehand for information at the record layer of an optical disk.
[0002]
[Description of the Prior Art] Drawing 4 is the block diagram showing the conventional objective lens driving gear. The perspective view in which drawing 4 (a) shows a whole configuration outline, and drawing 4 (b) are the view Figs. of the objective lens driving gear seen from the arrow head A. A Prior art is explained using drawing 4 .
[0003] An optical element group and 103 an optical pedestal and 102 for 101 which constitutes drawing 4 An objective lens, 104 a mirror and 105 a lens holder and 106a, 106b, 106c, and 106d A suspension, 107 damping gel, and 109a and 109b for a suspension holder and 108 A magnet, For the actuator base and 111, a focal coil, and 112a and 112b are [110 / a terminal area, and 114a and 114b of a tracking coil and 113a, 113b, 113c, and 113d] stoppers.
[0004] About the objective lens driving gear constituted as mentioned above, the actuation is explained below. An objective lens 103, the tracking coils 112a and 112b, and the focal coil 111 are carried in the lens holder 105. The end of tracking coil 112a is connected with the end of tracking coil 112b, the other end of tracking coil 112a is connected to terminal area 113c, and the other end of tracking coil 112b is connected to 113d of terminal areas, respectively. The end of the focal coil 111 is connected to terminal area 113a, and the other end is connected to terminal area 113b. Elastic support of the lens holder 105 is carried out by four suspensions 106a, 106b, 106c, and 106d which consist of conductive members in terminal areas [which are located in one end of the tangential direction of the optical disk of a lens holder 105 / 113a, 113b, 113c, and 113d] near. The Suspensions [106a, 106b, 106c, and 106d] other end is being fixed to the suspension holder 107. These lens holders 105 and the suspension holder 107 are constituted by the resin ingredient, and they are constituted so that interpolation shaping of the suspensions 106a, 106b, 106c, and 106d may be carried out. ****** is prepared in the suspension holder 107 at the position. The damping gel 108 for [this] adding a damping function for collecting in Suspensions 106a, 106b, 106c, and 106d is accumulated. Positioning immobilization of the suspension holder 107 is carried out at the position of the actuator base 110. In the actuator base 110, positioning immobilization of the magnets 109a and 109b is carried out at the position. The tracking coils 112a and 112b and the focal coil 111 which were carried in the lens holder 105 constitute a magnetic circuit with the actuator base 110 and Magnets 109a and 109b. And a lens holder 105 is driven in the thickness direction of an optical disk by supplying a drive current to the focal coil 111. A lens holder 105 is driven to radial [of an optical disk] by supplying a drive current to the tracking coils 112a and 112b. Stoppers 114a and 114b and the actuator base 110 of a lens holder 105 perform radial displacement regulation of an optical disk. The actuator base 110, the optical element group 102, and a mirror 104 are placed in a

fixed position by the position of the optical pedestal 101, respectively, and constitute an optical pickup. At the time of record and playback of the information on an optical disk, incidence of the light which emits light from the optical element group 102 is carried out to an objective lens 103 through a mirror 104, and irradiate the record layer of an optical disk, and the optical spot extracted with the objective lens 103 is made to follow a predetermined truck, and is performed.

[0005]

[Problem(s) to be Solved by the Invention] However, in the conventional objective lens driving gear, when a big impact was added by fall etc., the turning effort of the circumference of an optical axis occurred in the lens holder, and there was a problem that the suspension which carries out elastic support of the lens holder with this rotation displacement deformed plastically. Therefore, the inclination occurred in the objective lens, and a spot could not be correctly formed on the record layer of an optical disk, but there was a problem that informational record or playback became impossible.

[0006] This invention aims at offering the objective lens driving gear which can record and reproduce information correctly to the record layer of an optical disk, without carrying out plastic deformation of the suspension which carries out elastic support of the lens holder in view of this point, also when the big impact by fall etc. is added.

[0007]

[Means for Solving the Problem] rotation of the circumference of the optical axis of the objective lens generated in a lens holder by the external impact in this invention in order to solve the above-mentioned technical problem -- the rotation which regulates a variation rate -- a variation rate -- a regulation means -- having -- **** -- the 1st invention -- the both ends of the tangential direction of the optical disk of a lens holder -- the radial variation rate of an optical disk -- having specification-part material -- it is -- the 2nd invention -- the position of a lens holder -- the variation rate to the tangential direction of an optical disk -- it is having specification-part material. The 3rd invention is having a means having had the notching section prepared in the position of the actuator base or a suspension holder, and the radial height of an optical disk prepared in the position of a lens holder, and said height's having been made to insert in said notching section.

[0008]

[Embodiment of the Invention] (Gestalt 1 of operation) Drawing 1 is the block diagram showing the objective lens driving gear of the gestalt 1 of implementation of the 1st invention. The actuation is explained using drawing 1 centering on the component newly added to the conventional objective lens driving gear of drawing 4 . The stopper which prepared 1 newly prepared in the lens holder 105 to the conventional objective lens driving gear of drawing 4 , and 2 and 3 are the stoppers formed in the suspension holder 107. Hereafter, this actuation is explained.

[0009] By the external impact, when a lens holder 105 carries out rotation displacement, a lens holder 105 is rotated to the circumference of a center of gravity. so, the gestalt 1 of implementation of the 1st invention shows to drawing 1 -- as -- rotation of a lens holder 105 -- stoppers 2 and 3 are formed for a stopper 1 in the point of the lens holder 105 far from the center of gravity used as the supporting point of a variation rate at the suspension holder 107 side for the both ends of a stopper 1. Another side far from a center of gravity uses together the stoppers 114a and 114b formed in the lens holder 105. The clearance dC between a stopper 1 and a stopper 2 and the clearance dD between a stopper 1 and a stopper 3 have the same clearance, respectively. Clearances dC and dD are set as a radial predetermined movable distance of the optical disk of the objective lens 103 required at the time of informational record and playback. The clearance dC between stopper 114a and the actuator base 110 and the clearance dD between stopper 114b and the actuator base 110 are also set as a radial predetermined movable distance of an optical disk. and the rotation to the direction of A -- the case where a variation rate occurs -- a stopper 1 and a stopper 3 -- contacting -- stopper 114a and the actuator base 110 -- contacting -- rotation -- a variation rate -- it regulates. moreover, the rotation to the direction of B -- the case where a variation rate occurs -- a stopper 1 and a stopper 2 -- contacting -- stopper 114b and the actuator base 110 -- contacting -- rotation -- a variation rate -- it regulates and deformation of Suspensions 106a, 106b, 106c, and 106d is made into the inside of an elastic-deformation field.

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[0010] When impacts, such as fall, join an objective lens driving gear by this and a lens holder carries out rotation displacement at the circumference of an optical axis, deformation of a suspension is made into the inside of an elastic-deformation field by performing displacement regulation with the stopper formed in the lens holder and the suspension holder, and informational record and playback can be correctly performed to an optical disk, without making a lens holder generate an unnecessary inclination.

[0011] (Gestalt 2 of operation) Next, the gestalt 2 of implementation of the 2nd invention is explained. Drawing 2 is the objective lens driving gear of the gestalt 2 of implementation of the 2nd invention. It explains centering on the newly added component to the objective lens driving gear of drawing 1 .
[0012] 4 newly added to the objective lens driving gear of drawing 1 is the stopper formed in the lens holder. the gestalt 1 of implementation of the 1st invention -- rotation of a lens holder 105 -- since the variation rate was regulated with the radial predetermined movable distance dC and dD of an optical disk -- regulation rotation -- there is an inclination for a variation rate to become large. Therefore, with the gestalt 2 of the 2nd operation, the predetermined path clearance dA is formed between a stopper 1 and the suspension holder 107. When rotation displacement is carried out in the direction of A by the impact to the position of a lens holder 105, a stopper 1 and the suspension holder 107 contact, and path clearance dA is set up so that the deformation which is Suspensions 106a, 106b, 106c, and 106d may become in an elastic-deformation field. On the other hand, the predetermined path clearance dB is formed between a stopper 4 and the actuator base 110. When rotation displacement is carried out in the direction of B by the impact to the position of a lens holder 105, a stopper 4 and the actuator base 110 contact, and path clearance dB is set up so that the deformation which is Suspensions 106a, 106b, 106c, and 106d may become in an elastic-deformation field.
[0013] thereby -- an objective lens driving gear -- impacts, such as fall, -- being added -- a lens holder -- rotation of the circumference of an optical axis -- the stopper formed in the lens holder and the suspension holder when a variation rate occurred, and the stopper formed in a lens holder and the actuator base -- rotation -- informational record and playback can be correctly performed to an optical disk, without regulating a variation rate small, and making deformation of a suspension into the inside of an elastic-deformation field, and making a lens holder generate an unnecessary inclination.
[0014] (Gestalt 3 of operation) Next, the gestalt 3 of implementation of the 3rd invention is explained. Drawing 3 is the objective lens driving gear of the gestalt 3 of operation. It explains centering on the newly added component to the conventional objective lens driving gear of drawing 4 . As for 5 newly prepared to the conventional objective lens driving gear of drawing 4 , and 6, a height, and 7 and 8 are the notching sections.
[0015] rotation of the lens holder 105 when an impact joins an objective lens driving gear with the gestalt 2 of implementation of the 2nd invention -- a variation rate -- stoppers 1 and 4 were formed in the lens holder 105 as a regulation means. However, the path clearance dA and dB which performs displacement regulation shown in drawing 2 is a minute clearance, and it becomes difficult [management of path clearance dA and dB] with shaping and dimensional accuracy of a lens holder 105, the positioning accuracy of the actuator base 110 and the suspension holder 107, etc. comparatively [it].
[0016] So, with the gestalt 3 of implementation of the 3rd invention, the notching sections 7 and 8 are formed in the actuator base 110. When the notching sections 7 and 8 carry out positioning immobilization of the suspension holder 107 at the actuator base 110, they are located so that heights 5 and 6 may be inserted in the notching sections 7 and 8. When heights 5 and 6 are inserted in the notching sections 7 and 8, the clearance between heights 5 and 6 and the notching sections 7 and 8 is set up so that it may be set to dE, respectively. And when a lens holder 105 carries out rotation displacement by the external impact, heights 5 and 6 displace between Clearances dE, and displacement regulation of the Suspensions [106a, 106b, 106c, and 106d] deformation is carried out into an elastic-deformation field.
[0017] When impacts, such as fall, join an objective lens driving gear by this and a lens holder carries out rotation displacement at the circumference of an optical axis, by inserting in the notching section

which prepared the height prepared in the lens holder in the actuator base, and performing displacement regulation, deformation of a suspension is made into the inside of an elastic-deformation field, and informational record and playback can be correctly performed to an optical disk, without making a lens holder generate an unnecessary inclination. Moreover, management of the path clearance by shaping and dimensional accuracy of a lens holder, the positioning accuracy of the actuator base and a suspension holder, etc. becomes unnecessary.

[0018]

[Effect of the Invention] The lens holder in which the objective lens which forms a spot on the record layer of an optical disk was carried as explained above, The suspension where it is fixed to said lens holder, and an end carries out elastic support of said lens holder so that said lens holder may be made movable to radial [of said optical disk / the thickness direction and radial], The suspension holder holding the other end of said suspension, and the magnet made to generate magnetic flux, The actuator base which is made to arrange said magnet to a position and carries out positioning immobilization of said suspension holder at a position, The focal coil which it is carried [coil] in said lens holder and makes said lens holder generate the thrust to the thickness direction of said optical disk by the magnetic circuit of said magnet and said actuator base, It has the tracking coil which it is carried [coil] in said lens holder and makes said lens holder generate the radial thrust of said optical disk by the magnetic circuit of said magnet and said actuator base. rotation of the circumference of the optical axis of said objective lens generated in said lens holder by the external impact -- the rotation which regulates a variation rate -- a variation rate -- a regulation means -- having -- rotation -- a variation rate -- as a regulation means By equipping the both ends of a lens holder with the radial displacement specification-part material of an optical disk to the tangential direction of an optical disk, informational record and playback can be correctly performed to an optical disk, without making a lens holder generate an unnecessary inclination.

[0019] moreover, rotation -- a variation rate -- as a regulation means -- the position of a lens holder -- the variation rate to the tangential direction of an optical disk -- having specification-part material -- rotation -- informational record and playback can be correctly performed to an optical disk, without regulating a variation rate small, making deformation of a suspension into the inside of an elastic-deformation field, and making a lens holder generate an unnecessary inclination.

[0020] Moreover, by having the notching section prepared in the position of the actuator base or a suspension holder, and the radial height of an optical disk prepared in the position of a lens holder as a rotation displacement regulation means, and making said height insert in said notching section, deformation of a suspension is made into the inside of an elastic-deformation field, and informational record and playback can be correctly performed to an optical disk, without making a lens holder generate an unnecessary inclination. Moreover, management of the path clearance by shaping and dimensional accuracy of a lens holder, the positioning accuracy of the actuator base and a suspension holder, etc. becomes unnecessary, and the practical use effectiveness is large.

[Translation done.]

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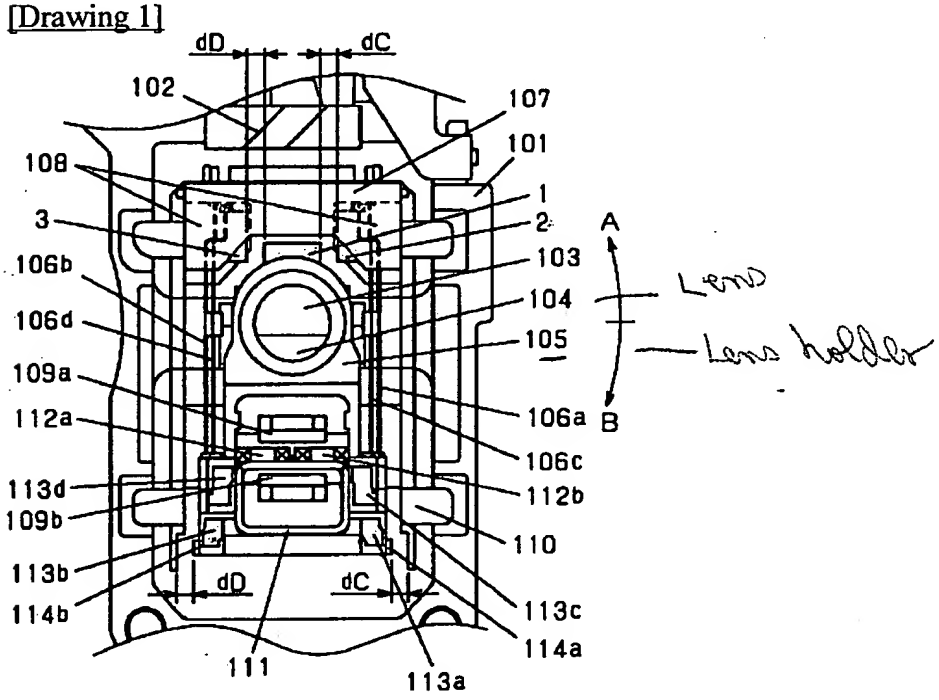
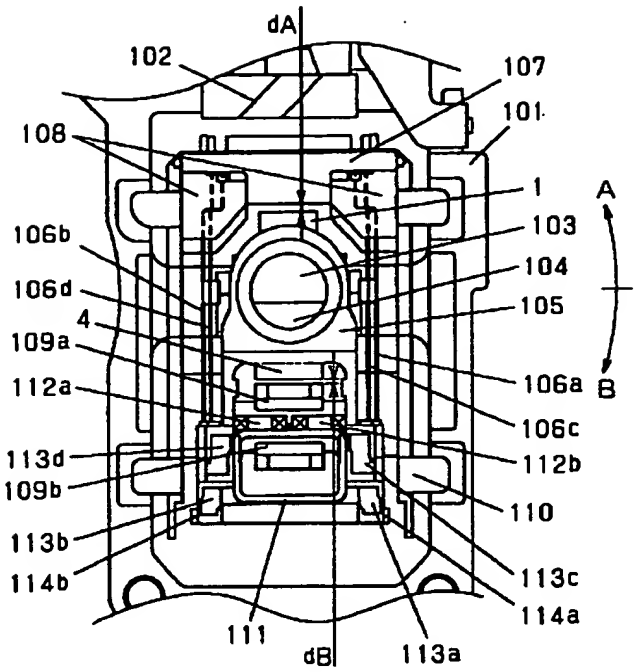
DRAWINGS

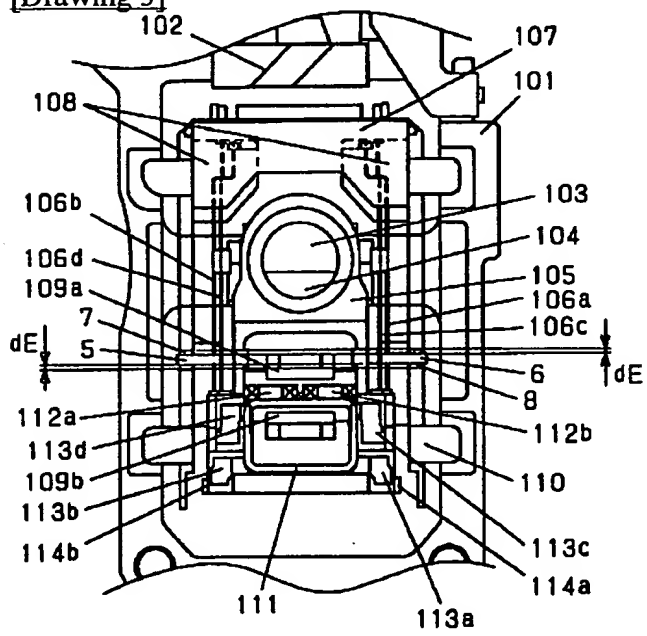
[Drawing 1]



[Drawing 2]



[Drawing 3]



[Drawing 4]

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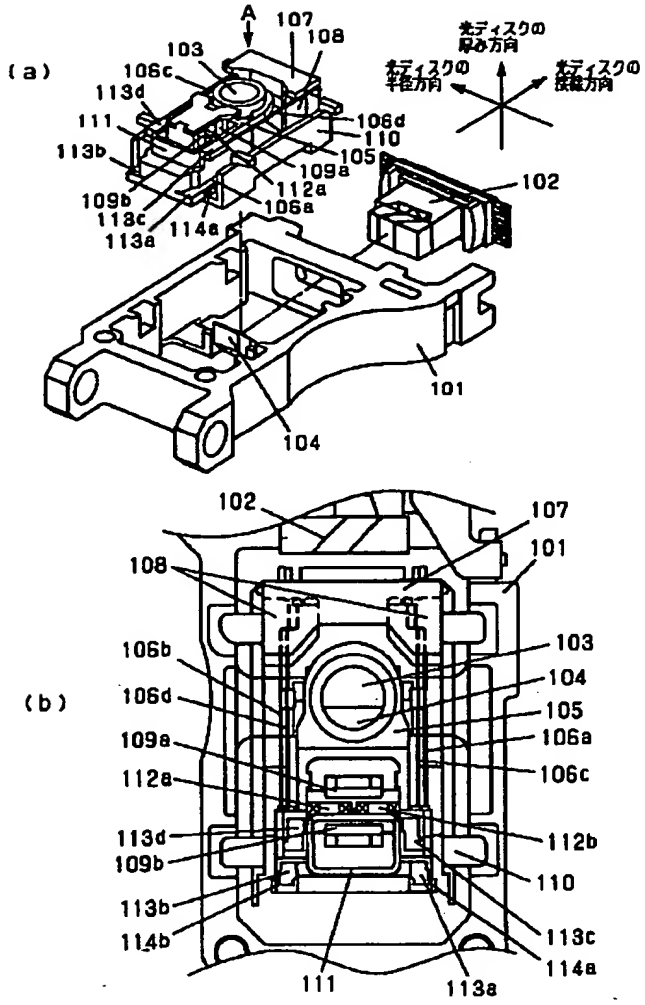

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